

cooltown:

Pervasive Web Computing

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Overview

- ★ Nomadic computing
- ★ cooltown: real-world web for nomadicity
- ★ Trend: future web

Thesis

Mobile Computing

Did that



Now/soon
via
the Web

Nomadic Computing



Pervasive Computing

Some way off

Mobile computing

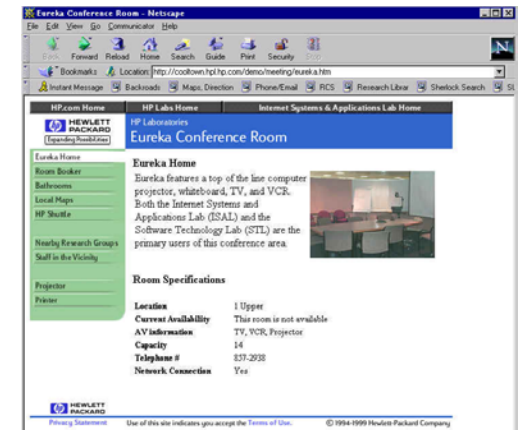
★ Portable devices



★ The wireless Internet

★ 'My PC with me'

802.11, WAP,
Bluetooth, ..

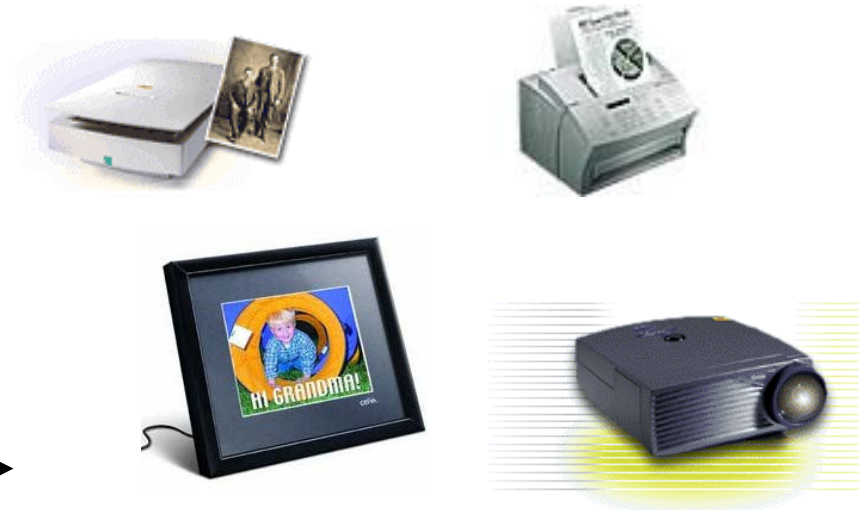


→ Pervasive Computing 1

★ Portable devices



★ Digital furniture

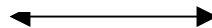
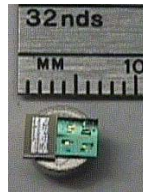


←→
802.11, WAP,
JetSend, Bluetooth, ..

→ Pervasive Computing 2

★ Smart things
(embedded devices)

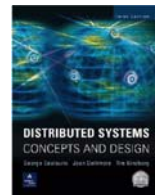
★ Everywhere



802.11, WAP,
Bluetooth, ..

→ Pervasive Computing 3

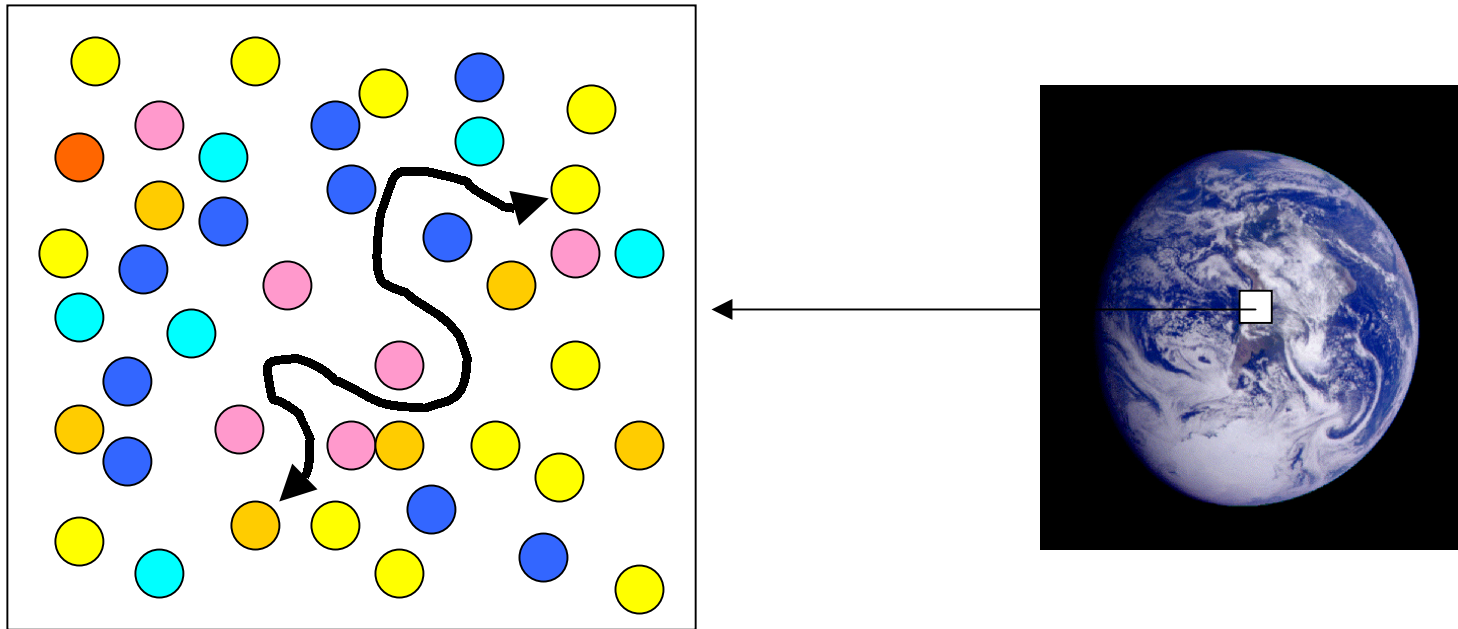
★ Real-world things with no electronic function



★ Virtual resources



Many resources per metre³...



.. all on the (wireless) Internet...

... so what governs their associations?

Pervasive Computing 2001, NIST, 1-2 May 2001

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“Imagine a world...

.. Where prescription and over-the-counter drugs talk to your home medicine cabinet..

.. Where your laundry talks to the washing machine..

.. Where packaged food talks to your microwave..”

(associations envisaged by auto-id.mit.edu)

Growing up digital

- ★ 'Switch on'
- ★ 'Discover' ('associate')
- ★ 'Interact'
- ★ Toaster:
 - ✦ Loaded with model of all 'appropriate' 'partners', anywhere?
 - ✦ 'Learns'?



Pervasive computing

Opportunities: many

Problem: managing associations

cooltown: Web presence for the real world

cooltown

- ★ Nomadic Computing
 - ✦ Humans interact with the real world & its virtual counterparts
- ★ Web-centric
- ★ Humans are the smart semantic processors
- ★ Infrastructure is powerful
- ★ Devices are 'naïve'

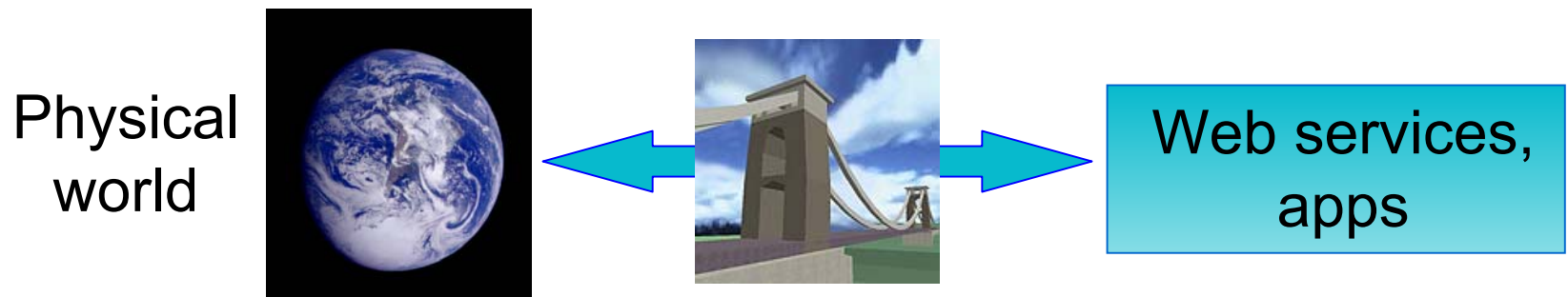


The Web

- ★ A distributed system with users in the loop
- ★ Well understood standards (URIs, HTTP, ..)
- ★ Content-oriented: just enough agreement
- ★ Widely deployed
- ★ ∴ Suited for nomadic, pervasive computing
 - ✦ Once we solve the association problem

Real-world wide web

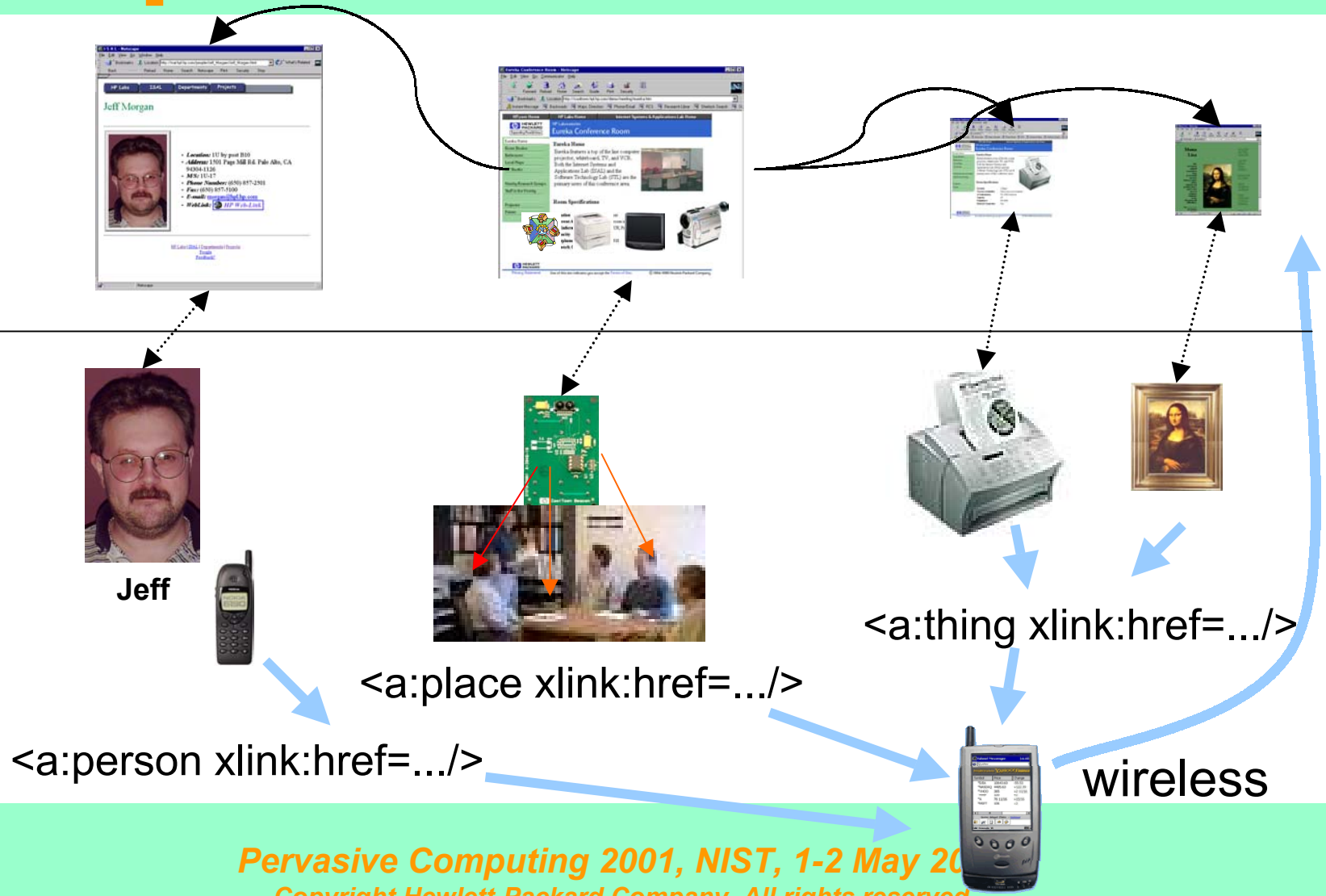
- ★ Correlate physical entities and web services
- ★ Integrate physical entities in applications
- ★ Humans make associations



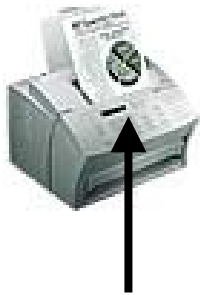
Web presence

Web

Real



Web presence practicality



Embedded web server
(1" square, \$20)



Web server



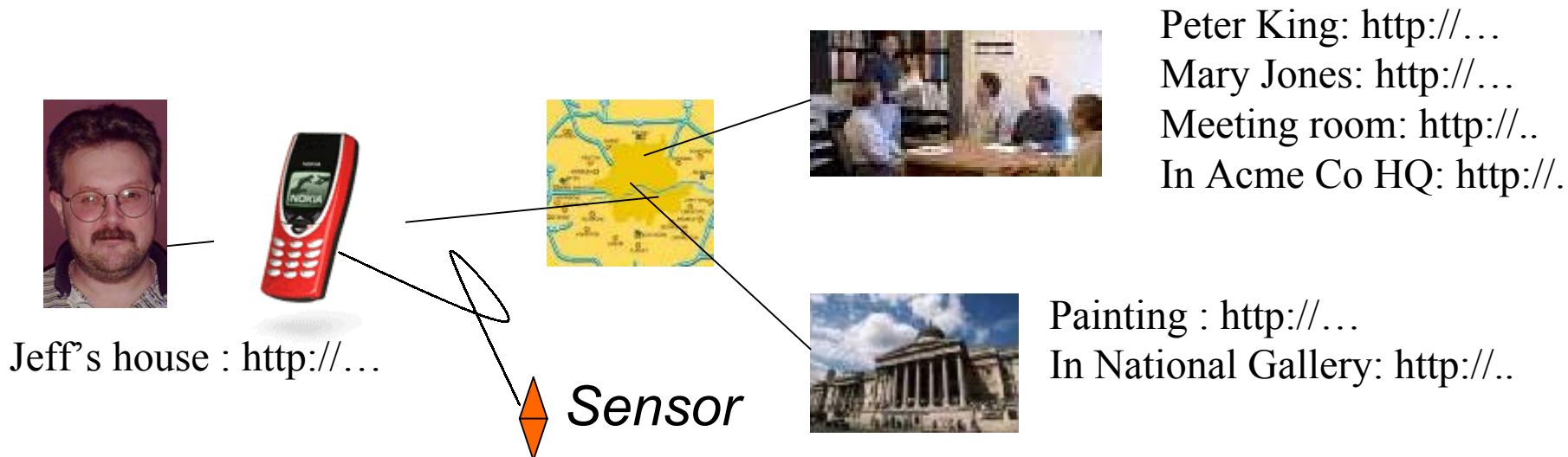
- Tag / beacon
(0¢-\$1)



Integrated IR /
barcode
reader

Nomadcity

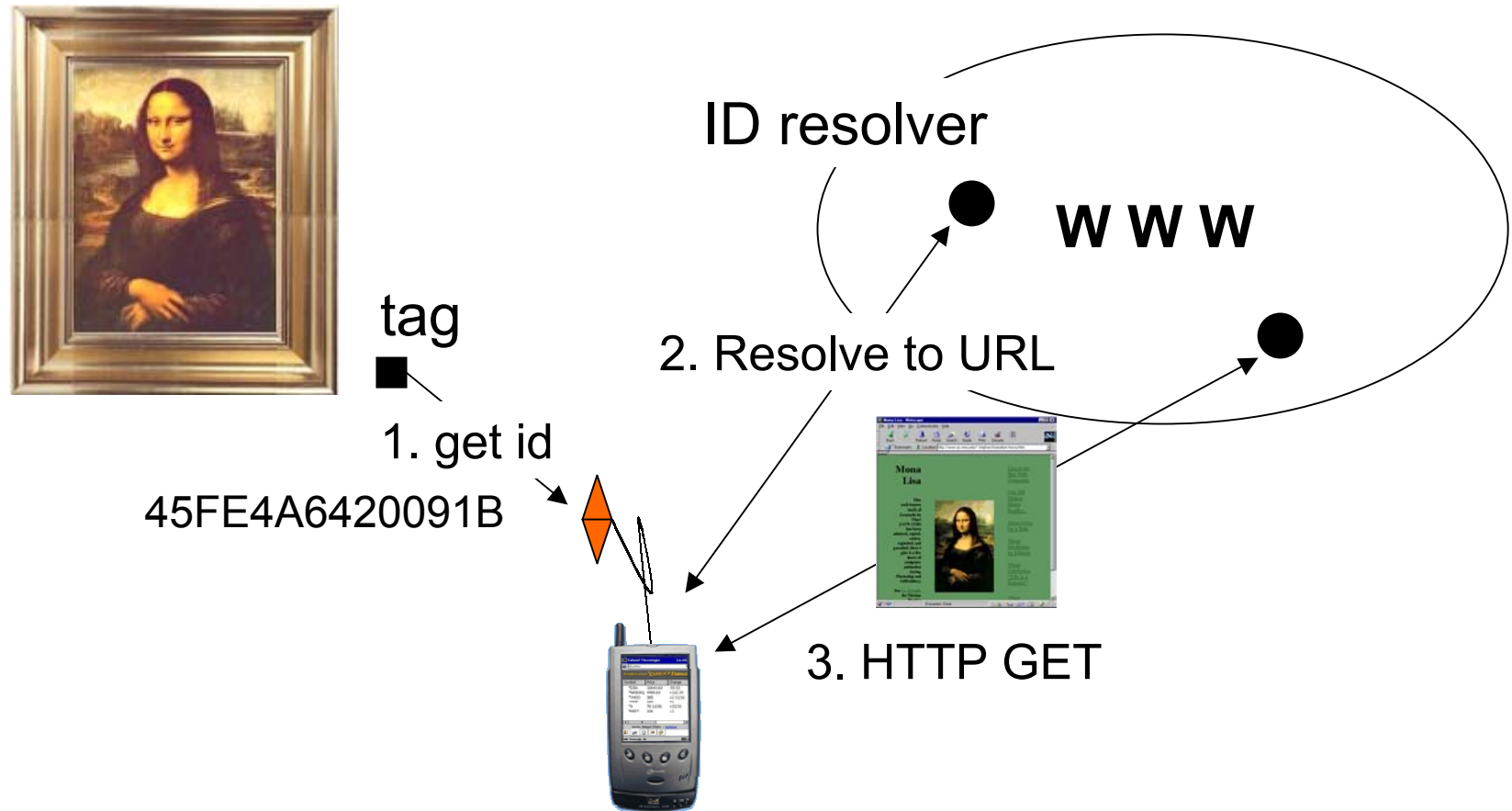
- ★ People travel around places
- ★ Carry devices with sensors (IR, barcode, ..)
- ★ Collect the URLs of People, Places and Things



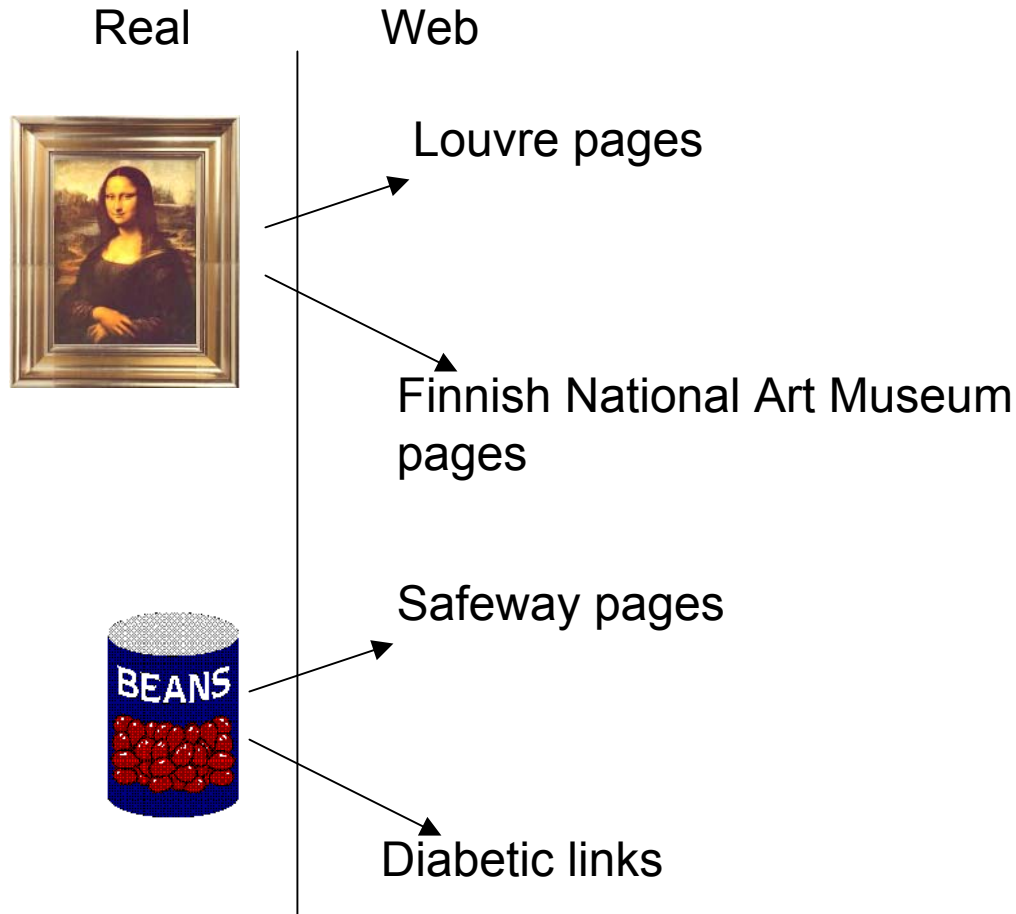
Handheld clipboards for URLs



ID resolution



Context



Choice of ID-resolver

- ❖ *Where am I?*
- ❖ *Who am I?*
- ❖ *What am I/are we doing?*

Web-sign

equipped with:

gps, infrared etc. for
global and local
positioning

compass for heading

wireless internet



cooltown contributions

- ★ First embedded web servers; ChaiServer
- ★ Web presence for people, places & things
 - ✦ Beacons, PlaceManager, WebLink, ...
- ★ E-squirt: nomadic use models
- ★ ID-resolution & Websign: contextual mapping from the physical to the virtual
- ★ Where to?

Future Web

Web evolution

Server

Client

Associations

Static
or mobile



Nomadic



Pervasive



?

**The semantic
processing
future**

Pervasive Computing 2001, NIST, 1-2 May 2001

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The software formerly known as 'browser'

- ★ Sensor input to web forms
- ★ Web form-filling clerk
 - ✦ embeddable in cameras, toasters, ..
 - ✦ may or may not have physical UI
 - ✦ can project UI as web page
- ★ Naïve devices
 - ✦ producers, consumers, peers?



Conclusion

- ★ Correlating people, places, things and the virtual world of Web services & apps
- ★ Tagged entities, users with sensor-equipped handhelds
- ★ Where next: web browser evolution and 'web coordination'. User Studies!

cooltown.hp.com
www.exploratorium.edu/guidebook/